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**Seat and method**

The invention relates to a seat, in particular a vehicle seat, according to the precharacterizing clause of claim 1. In particular for motor vehicles, it is increasingly required to provide components which satisfy the comfort needs of their users to an ever greater extent. In the case of seats for motor vehicles, this is manifested in that, for example as entry aid into a motor vehicle for users of the motor vehicle who would like to sit down on the rear seat bench of a motor vehicle, the backrest of a seat situated in front of the rear seat bench is to be folded forward, i.e. away from the rear seat bench. For vehicles, especially what are referred to as "vans" or "large-capacity saloons", which are particularly suitable in particular for families, it is advantageous for further function possibilities or positions of vehicle seats to be possible; for example, the backrest of a seat of this type can be folded forward in such a manner that the rear side of the backrest can be used as a table.

It is generally known to use vehicle seats which, in particular in vehicles which do not have separate doors as access to a rear seat bench, have a backrest in such a manner that the backrest of the vehicle seat is folded forward for more comfortable entry of passengers to the rear seat bench. For this purpose, a mechanical unlocking device is generally actuated manually, so that the backrest, which is provided in a manner such that in its normal position it is locked in a certain, settable angle of inclination with respect to the seat surface, can be folded forward. It is disadvantageous in this case that the entire lower seat structure sticks in the same position, i.e. remains at the same location, and therefore continues to be in the way

during the entry of the passengers.

The invention is therefore based on the object of providing a seat, in particular a vehicle seat, which  
5 has a maximum amount of possibilities of variation in respect of its setting positions provided for different use situations. Furthermore, provision is made according to the invention to prevent a misuse of the setting possibilities or a combination of setting  
10 possibilities that has not been envisaged.

This object is achieved according to the invention by a seat with a backrest part and with a seat part, the backrest part being provided in a manner such that it  
15 can be folded relative to the seat part from a normal position into a folded position and vice-versa, the seat having a lower seat structure, the seat part being provided in a manner such that it is movable relative to the lower seat structure, furthermore, in order to  
20 fasten the seat part to the lower seat structure, at least one front first fastening, one rear second fastening and one diagonal fastening being provided, the seat being provided in a manner such that it can be adjusted at least into an entry position and into a  
25 lowered position apart from into a normal position, the second fastening being provided in a manner such that it is released in the entry position, and the diagonal fastening being provided in a manner such that it is released in the lowered position. This results in the  
30 maximum amount of setting possibilities leading to an increase in the ease of operation during the use of the seat and the motor vehicle.

In a preferred embodiment of the invention, in the  
35 entry position the seat part is provided in a manner such that it is separated in the region of the second fastening from the lower seat structure, and/or in the lowered position the diagonal fastening is provided in a manner such that it is displaced longitudinally in

relation to its setting in the normal position. This in particular affords the advantage that the location at which the seat part is in its normal position can be released for use by an occupant. Furthermore, this  
5 affords the advantage that the seat is provided in a manner such that it can be lowered, i.e. that even in the case of a relatively thick backrest part of the seat, the backrest can be used as a table without a "table" of this type being unsuitable for use in the  
10 vehicle because, for example, it is arranged too high.

Furthermore, it is advantageous that, in order to separate the seat part in the region of the second fastening, a second actuator is provided, and/or that,  
15 in order to longitudinally displace the diagonal fastening, a first actuator is provided, the first and/or the second actuator being provided in particular as electric motor actuators. In an advantageous manner, this has the effect that the various setting  
20 possibilities of the seat can be made possible in an automated or controlled manner and therefore a direct unlocking by a user is unnecessary, which firstly facilitates the use because, for example, there is no need to fiddle around at inaccessible points of the  
25 seat, and secondly simplifies the construction of the seat and therefore makes it less expensive because no awkward and weight-causing handles, levers or other actuating devices have to be provided.

30 Furthermore, it is advantageous that first monitoring means are provided, the first monitoring means leading to the diagonal fastening being prevented from being released in the entry position, and/or that second monitoring means are provided, but the second  
35 monitoring means leading to the second fastening being prevented from being released in the lowered position. As a result, it is advantageously possible according to the invention for a misuse of the various adjustment possibilities of the seat due to improper use to be

largely ruled out.

Furthermore, it is advantageous that triggering means are provided, the triggering means, with the backrest  
5 in its folded position, leading either to the diagonal fastening or the second fastening being released only during a predetermined time interval. As a result, misuses of the seat use are further restricted.

10 Furthermore, it is advantageous that the first monitoring means and/or the second monitoring means and/or the triggering means are provided as microswitches. By this means, it is possible in a particularly simple and cost-effective manner to  
15 provide the monitoring means according to the invention on a seat.

Furthermore, it is advantageous that the seat has a control device for controlling the release of the  
20 fastenings as a function of the position taken up by the seat. By realizing the control device, for example as a programmable control device, it is possible according to the invention in the simple manner to rule out a misuse of the various adjustment possibilities of  
25 the seat according to the invention.

The present invention furthermore relates to a method in which a seat according to the invention is controlled in such a manner that it has a maximum  
30 amount of setting possibilities which can be selected by the user and at the same time a misuse of this increased functionality is greatly restricted.

The invention is explained in more detail below with  
35 reference to exemplary embodiments illustrated in the drawing.

Figure 1 shows a seat according to the invention with a backrest part and a seat part.

Figure 1a is a diagram of a control.

5 Figure 2 shows various components of the seat according to the invention in an enlarged illustration.

Figure 3 shows a detail of a side part of the seat part 3 with attached triggering means.

10 Figure 4 shows the diagonal fastening.

Figure 5 shows the second fastening.

15 Figures 6a to 6g show a sequence of positions of the seat according to the invention with respect to the entry position.

20 Figures 7a to 7g show a sequence of positions of the seat according to the invention with respect to the lowered position.

25 Figures 8a to 8d show a first sequence of partially misusable positions of a seat.

30 Figure 9 shows the monitoring principle illustrated in figure 8 using a logic diagram.

Figures 10a to 10d show a second sequence of partially misusable positions of a seat.

35 Figure 11 shows the monitoring principle illustrated in figure 10 using a logic diagram.

Figure 1 shows a vehicle seat 1 according to the

invention or seat 1 with a backrest part 2 and a seat part 3, the seat part 3 being connected to a lower seat structure 4 via a front first fastening 20, a rear second fastening 40 and a diagonal fastening 30.

5 According to the invention, the seat 1 is provided in particular such that it is largely symmetrical with respect to its longitudinal axis, so that, in an advantageous embodiment of the seat 1, both the front first fastening 20 and the second fastening 40 and the

10 diagonal fastening 30 are provided both on the left side and on the right side of the seat 1. However, the fastenings 20, 30 and 40 are discussed in detail below without differentiating the two sides of the seat 1, but in each case both sides of a particular fastening

15 20, 30 and 40 are meant.

Figure 1a diagrammatically illustrates the control 10 which is connected to a triggering means 21, a first monitoring means 31, a first actuator 32, a second

20 monitoring means 41, a second actuator 42 and an actuating means 43. By means of the control 10, the actuators 32, 42 of the second fastening 40 and of the diagonal fastening 30, respectively, are controlled as a function of the states of the triggering means 21 and

25 of the monitoring means 31, 41 and of the actuating means 43, i.e. as a function in particular of the existing locking and/or unlocking state of the seat.

Figure 2 illustrates various components of the seat

30 according to the invention in an enlarged illustration which is enlarged explosively. Of the seat part 3 (not completely illustrated), only a lateral frame 3b is illustrated, on which the triggering means 21 can be seen. Furthermore, the second fastening 40 and the

35 diagonal fastening 30 are illustrated with their individual parts. The second fastening 40 comprises the second actuator 42 and the second monitoring means 41. The diagonal fastening 30 comprises the first actuator 32 and the first monitoring means 31. Also indicated is

an actuating part 23 which is connected to the backrest part 2, is moved by a movement of the backrest part 2 and actuates the triggering means 21 when the backrest part 2 is folded forward.

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Figure 3 illustrates a detail of the side part 3b of the seat part 3 with attached triggering means 21, with, in a left part of figure 3, the actuating means 23, which moves as a function of the position of the backrest or of the backrest part 2, interacting with the triggering means 21 in such a manner that the triggering means 21 signals a folding forward of the backrest part 2 into its folded position. In the right part of figure 3, the actuating part 23 is provided corresponding to the normal position of the backrest part 2, so that the actuating part 23 does not interact with the triggering means 21 and does not signal the folded position of the backrest part 2.

20 Figure 4 illustrates the diagonal fastening 30 with its first actuator 32, its first monitoring means 31 and an adjusting clip 34 on which the first actuator 32 acts. When the first actuator 32 acts on the adjusting clip 34 of the diagonal fastening 30, the diagonal fastening 30 is released and, according to the invention, can be displaced in particular longitudinally.

Figure 5 illustrates the second fastening 40, the second fastening 40 comprising the second actuator 42, the second monitoring means 41 and likewise an adjusting clip 44 on which - analogously to the diagonal fastening 30 - the second actuator 42 acts. When the second actuator 42 acts on the adjusting clip 44 of the second fastening 40, the second fastening 40 is released and, in particular, can release the seat part 3 relative to the lower seat structure 4, with the result that the seat 1 or the backrest part 2 together with the seat part 3 is provided in a manner such that it can rotate about the front first fastening 20 or

about an axis of rotation in the region of the front first fastening 20.

Figures 6a to 6g illustrate a sequence of positions of the seat 1 according to the invention in order to illustrate the setting of the seat 1 from its normal position into its entry position and back into its normal position. The designation of the various components of the seat has been omitted in each case of these partial figures for the sake of simplicity. Figure 6a illustrates the seat 1 in its normal position. The seat 1 is illustrated with a backrest part 2 folded forward in figure 6b. By folding the backrest part 2 forward, the triggering means 21 is activated, so that the second actuator 42 can provide a release of the seat part 3 in the region of the second fastening 40, which is illustrated in figure 6c. Figure 6d illustrates the entry position of the seat 1. It can be seen that at the point at which the seat part 3 is in the normal position there is sufficient space in order, for example, to make it possible for a user to comfortably enter a motor vehicle. Figure 6 illustrates the movement of the seat 1 or of its backrest part 2 and its seat part 3 back into the normal position, with a latching of the second fastening 40 taking place in figure 6f, so that the seat part 3 is again connected fixedly to the lower seat structure 4. Figure 6g illustrates the seat 1 in its normal position.

Figure 7a to figure 7g illustrate a sequence of positions of the seat 1 according to the invention in order to illustrate the setting of the seat 1 from its normal position into its lowered position and back into its normal position. The designation of the various components of the seat has been omitted in each case of these partial figures for the sake of simplicity. Figure 7a illustrates the seat 1 in its normal position. According to the invention, provision is made for a user to be able to initiate the setting of the



lowered position by means of the actuating means 43 which is connected to the control 10 but which is not illustrated in the figures - apart from diagrammatically in figure 1a. To this end, the user  
5 actuates the actuating means 43, for example a push-button switch, touch screen or the like, as a result of which it is signaled to the control 10 that the user intends to set the seat 1 into the lowered position. The actuation of the actuating means 43 therefore makes  
10 it possible to differentiate between the user's desire to set the seat into the entry position and into the lowered position. The seat 1 is illustrated in figure 7b with a backrest part 2 folded forward. By folding the backrest part 2 forward, the triggering means 21 is  
15 activated, so that - because of the actuation of the actuating means 43 which has previously taken place - the first actuator 32 can permit a longitudinal displacement of the diagonal fastening 30, the beginning of which is illustrated in figure 7c and the  
20 complete displacement of which is illustrated in figure 7d. Figure 7d at the same time illustrates the lowered position of the seat 1. The "parallelogram" formed by the first fastening 20 in the second fastening 40 is obtained by a diagonal fastening 30 being latched, i.e.  
25 locked, in the normal position of the seat 1. In the case of the lowered position of the seat 1, then, by unlocking the diagonal fastening 30, a longitudinal displacement of the same is possible, which - by a corresponding manual user operation - leads to the  
30 parallelogram "collapsing". Figure 7e illustrates the movement of the seat 1 or of its backrest part 2 and its seat part 3 back into the normal position, with, in figure 7f in turn, a longitudinal displacement of the diagonal part taking place leading, in figure 7g, to  
35 the diagonal fastening 30 latching into place in a position corresponding to the normal position of the seat 1.

Figure 8a to figure 8d illustrate a first sequence of

positions of a seat in order to illustrate the setting of the seat from the lowered position into an unpermitted position misusing the range of setting possibilities of a seat. In the lowered position of the seat 1 that is illustrated in figure 8a, the diagonal fastening 30 is set in a manner such that it is displaced longitudinally. If, in this situation, the backrest part 2 is set upright (cf. figure 8b) - with the triggering means 21 being switched off - and is subsequently set again into its folded position (cf. figure 8c) - the triggering means 21 again being actuated by the actuating part 23 and an unlocking or a release of the second actuator 42 being initiated by the control 10 - it is possible that by release of the second fastening 40 (cf. figure 8d), a folding of the seat 1 forward about an axis of rotation situated in the region of the first fastening 20 is conceivable in spite of the diagonal fastening 30, which is of course not locked in the lowered position. According to the invention, such a misuse of the setting possibilities is prevented by the first monitoring means 31 being attached to the diagonal fastening 30 and being actuated by the diagonal fastening 30 being released in the lowered position and, when they are actuated, preventing the second fastening from being released, i.e. preventing an actuation of the second actuator 42.

Figure 9 once again illustrates, using a logic diagram, the monitoring principle illustrated in figure 8 for preventing the misuse illustrated in the case of a seat 1 according to the invention. Figure 9 indicates for rows which illustrate states of various components of the seat 1 according to the invention. Each row illustrates the time profile  $t$  of the state of the particular component. The designation "0" means that, in this case, the corresponding component is inactive or is not actuated. The first row relates to the actuating means 43, the second row relates to the triggering means 21, the third row relates to the first

actuator 32 and the fourth row relates to the first monitoring means 31. At a first time  $t_1$ , the actuating means 43 is activated by a user actuation. In consequence, the backrest part 2 is set into its folded position. When the folded position is reached, the triggering means 21 is activated as a result (by means of the actuating part 23) which is the case at the second time  $t_2$ . By the actuation of the triggering means 21, the control 10 activates the first actuator 32 during a predetermined time interval  $T$  of, for example, 500 ms in order to make it possible to reach the lowered position. If the first actuator 32 has released the adjusting clip 34 of the diagonal fastening 30, the first monitoring means 31 is activated at the third time  $t_3$ . The control 10 is provided according to the invention in such a manner that a subsequent activation of the second actuator 42 does not take place for as long as the first monitoring means signals an unlocking of the diagonal fastening 30 and this also applies to the situation in which the triggering means 21 - if appropriate by means of adjustment operations (illustrated in figure 8) of the backrest part 2 - is again actuated and in principle could bring about a release of the second fastening 40 by activation of the second actuator 42.

Figure 10a to figure 10d illustrate a second sequence of positions of a seat in order to illustrate the setting of the seat from the entry position into an unpermitted position misusing the variety of setting possibilities of a seat. In the entry position of the seat 1 that is illustrated in figure 10a, the second fastening 40 is provided in a manner such that it is released, i.e. the backrest part 2 and the seat part 3 can be folded forward about an axis of rotation situated in the region of the first fastening 20. If, in this situation, the backrest part 2 is set upright (cf. figure 10b) - with the triggering means 21 being switched off - and is subsequently set again into its

folded position (cf. figure 10c) - with the triggering means 21 again being actuated by the actuating part 23 and an unlocking or a release of the first actuator 32 being initiated by the control 10 - it is possible, by the release of the diagonal fastening 30 (cf. figure 10d) for a longitudinal displacement of the diagonal fastening 30 to be conceivable in spite of the second fastening 40 of course not being in the entry position. Such a misuse of the setting possibilities is prevented according to the invention by the second monitoring means 41 being attached to the second fastening 40 and being actuated by the second fastening 40 being released in the entry position and, when they are actuated, preventing the diagonal fastening 30 from being released, i.e. preventing an activation of the first actuator 32.

Figure 11 once again illustrates, using a logic diagram, the monitoring principle illustrated in figure 10 for preventing the misuse illustrated in the case of a seat 1 according to the invention. Figure 11 indicates three rows which illustrate states of various components of the seat 1 according to the invention. Each row illustrates the time profile  $t$  of the state of the particular component. The designation "0" means, in this case, that the corresponding component is inactive or is not actuated. The first row relates to the triggering means 21, the second row relates to the second actuator 42 and the third row relates to the second monitoring means 41. At a fourth time  $t_4$ , the backrest is adjusted by a mechanical unlocking of the locking of the backrest part 2. In consequence, the backrest part 2 is set into its folded position. When the folded position is reached, the triggering means 21 is activated as a result (by means of the actuating part 23, which is the case at the fifth time  $t_5$ . By means of the actuation of the triggering means 21, the control 10 activates the second actuator 42 during a predetermined time interval  $T$  of, for example, 500 ms

in order to make it possible to reach the entry position. If the second actuator 42 has released the adjusting clip 44 of the second fastening 40, the second monitoring means 41 is activated at the sixth  
5 time t6. The control 10 is provided according to the invention in such a manner that a subsequent activation of the first actuator 32 does not take place for as long as the second monitoring means 41 signals an unlocking of the second fastening 40 and this also  
10 applies to the situation in which the triggering means 21 - if appropriate by means of adjustment operations of the backrest part 2 that are illustrated in figure 10 - is actuated again and in principle could bring about a release of the diagonal fastening 30 by  
15 activation of the first actuator 32.

According to the invention, the triggering means 21 and the monitoring means 31, 41 are provided in particular as contact switches or as microswitches which are  
20 switched mechanically by the movement of certain components. The actuating part 23 for actuating the triggering means 21 is representative of these components. In this connection, provision can in particular be made according to the invention for some  
25 of the triggering or monitoring means 21, 31, 41 to carry out a monitoring of the state while others of them carry out a monitoring of changes. For example, provision is made according to the invention for the triggering means 21 to react to "flanks" or to be  
30 evaluated by the control device 10 in respect of "flanks" of its signal while the first and second monitoring means 31, 41 only react to detected or assumed states, i.e. are evaluated by the control device 10 exclusively in respect of signals at a  
35 particular moment. From the latter, the advantage is afforded that the evaluation of the monitoring means 31, 41 is independent of the movement history of the seat and therefore an increased robustness of the system is provided, for example in the case of current

failures.

The distinction between the setting of the lowered position or of the entry position from the normal position can also take place according to the invention by a selection switch (not illustrated) being provided, the one setting possibility of which represents the setting of the lowered position and the other setting possibility of which represents the setting of the entry position. As a result, a user of the seat according to the invention can set these two positions unambiguously and separately or initiate the setting thereof.

**List of designations:**

	1	Seat
	2	Backrest part
5	3	Seat part
	3b	Side part of the seat part
	4	Lower seat structure
	10	Control
	20	First fastening
10	21	Triggering means
	30	Diagonal fastening
	31	First monitoring means
	32	First actuator
	34	Adjusting clip of the diagonal fastening
15	40	Second fastening
	41	Second monitoring means
	42	Second actuator
	43	Actuating means
	44	Adjusting clip of the second fastening
20	t	Time profile
	t1	First time
	t2	Second time
	t3	Third time
	t4	Fourth time
25	t5	Fifth time
	t6	Sixth time
	T	Time interval